of the steel in terms of hardness and grain boundary carbide amount and requiring the presence of Cu.

The rejections are flawed and must be withdrawn for the reasons that Miyata fails to suggest concrete examples that satisfy the range of the steel composition recited in the claims. Miyata is also different from the invention with respect to the characteristics of hardness and carbide precipitation, including the heat treatment for insuring the presence of the claimed characteristics.

Hara also fails to establish a *prima facie* case of obviousness since this reference is also different from the invention in terms of the characteristics of carbide precipitation, the hardness, and the heat treatment process for insuring the carbide precipitation and hardness.

The specific reasons for the traversals of the rejections are set out below under the headings of the applied prior art and subheadings related to the errors in the rejection.

MIYATA

<u>It is error to conclude that the processing of Miyata is the same as that producing the claimed steel's characteristics.</u>

Miyata is completely different from the invention from a production process and this means that the Examiner cannot conclude that the claimed hardness and carbide amount would be expected.

The basic technological premise of the invention can be found in paragraphs [0074-0076] of Applicants' published patent application, wherein it is stated

The martensitic stainless steel according to the invention may be obtained through a process in which steel having a specified chemical composition is hot worked and then a predetermined heat treatment is applied thereto. For instance, a steel material is heated in a temperature of the Ac_3 point or more, and then cooled by the quenching or air cooling (slow cooling) after hot worked.

Alternately, the above treatment is applied to the steel material and it is thus cooled down to room temperature, and subsequently the steel material is quenched or air cooled in the final treatment, after again heating it at a temperature of the Ac_3 point or more. The quenching often provides too much increase in the hardness and a reduction in the toughness, so that the air cool is preferable to the quenching.

After cooled, the tempering can be applied in order to adjust the mechanical strength. However, the tempering at a high temperature provides not only a reduction in the mechanical strength of the steel, but also an increase in the amount of the carbides in the grain boundaries of the prior austenite, thereby causing the localized corrosion to be induced. In view of this fact, it is preferable that the tempering should be carried out at a low temperature of not more than 400 °C.

From this, it is clear that tempering above 400 °C should be avoided. Doing so means that the precipitation of carbides in the grain boundaries of the prior austenite is avoided.

In contrast, Miyata teaches in col. 5, lines 1-38 as follows:

> The above heat treatment performed after quenching is an important to achieving the advantageous characteristics of the present invention. The following three types of methods (1), (2), (3) can be applied in accordance with the invention.
>
> (1) Tempering effected at about 550 °C. or higher to a temperature lower than the Ac_1 point
>
> Since the steel pipe is made to a uniformly tempered martensitic microstructure by being tempered in a temperature range from about 550°C. to lower than the Ac_1 point, excellent toughness can be obtained. When the tempering temperature is lower than about 550°C., tempering is insufficiently performed and adequate toughness cannot be obtained.
>
> Importantly, the steel pipe is preferably held for about 10 minutes or longer in the above temperature range during the tempering process, and the steel pipe may be air-cooled or water-cooled after it is tempered in accordance with the invention.

(2) Heat treatment performed in a temperature range from the Ac_1 point to the Ac_1 point + about 50°C. (heat treatment in a dual-phase region)

A steel pipe in accordance with the invention is made to a fine dual-phase microstructure composed of martensitic and austenite by being subjected to a heat treatment at the Ac_1 point or higher and made to a fine martensitic microstructure by being cooled thereafter. Although un-tempered martensitic which is not tempered is mixed in the micro structure, the fine structure increases toughness. However, when a steel pipe is subjected to a heat treatment at a temperature exceeding the Ac_1 point + about 50°C., grains are roughened and toughness deteriorates.

The steel pipe is preferably held between about ten minutes to 60 minutes in this temperature range, and thereafter may be air-cooled.

(3) Heat treatment performed in a temperature range from the Ac_1 point to the Ac_1 point + about 50°C., and tempering performed thereafter at a temperature substantially equal to the Ac_1 point or lower

This passage means that the heat treatment after quenching entails a tempering at a temperature in the range of 550 °C to the Ac_1 point or a heat treatment at a temperature in the dual phase region, or alternatively a combination of both.

From this, it can be concluded that Miyata fails to disclose a heat treatment similar to Applicants, which is characterized as by an as-quench condition from a temperature of Ac_3 point or more, or further by a low temperature tempering at 400°C or less.

As explained in the cited section of Applicants' specification, an ordinary tempering such as performed in Miyata, namely a tempering temperature in the range of 550 °C to the Ac_1, point allows carbides to precipitate at the grain boundaries. Similarly, heating at a temperature in the dual phase region not only allows carbides to precipitate but also cause the γ phase to form to thereby reduce strength and HRC hardness.

Based on the above, the Examiner cannot reasonably take the position that the claimed characteristics of claim 1, i.e., the hardness of 30-45 HRC and the carbide amount in grain boundaries of not more than 0.5 volume %, are present. The alleged

"plastically processed history" of Miyata is not even similar to that used to produce the claimed characteristics and the rejection fails for this reason alone.

<u>It is error to assume that the claimed composition and equation are obvious from Miyata.</u>

Miyata fails to concretely disclose chemical compositions of martensitic stainless steel as found in claims 1 and 3. In the embodiments of Tables 1 and 2 of Miyata, all of the disclosed examples indicate a content of Mn more than 1.47%. In the case of the embodiments of Table 3, all examples show a Mn content of 1.51% or more. All of these examples fall outside the claimed upper limit of 0.95% Mn of claims 1 and 3.

In addition, all of the examples of Table 2 of Miyata have a C content of 0.018% or less. This is outside the claimed range of 0.02 to 0.10% C. Since Miyata does not disclose a composition that satisfies the equation, the Examiner must treat the equation from an obviousness standpoint.

In the rejection, the states:

> With respect to the formula $0.2 \leq Mo + Cu/4 \leq 5$ of claims 1 and 3, it is well settled that there is no invention in the discovery of a general formula if it covers a composition described in the prior art.

The problem with this approach is that Miyata does not disclose the claimed composition so that it cannot be assumed that the composition of Miyata inherently satisfies the formula. The Examiner is improperly saying that the existence of a mere overlap in composition means that any formula associated with the composition overlapped by the prior art cannot carry any patentable weight. If the Examiner continues to take this position, the Examiner is called upon to support such a stance with reference to established case law.

Moreover, the formula is not an arbitrary one but one that produces improvements when met. This is evident from the comparative evidence of the specification. This is further substantiation that the Examiner has not established a *prima facie* case of obviousness against either of claims 1 and 3.

The hardness limitation is not present in Miyata

As explained above, the Examiner admitted that the claimed hardness was not expressly taught in Miyata but that it would be exhibited to be present. To contest this stance, Applicants submit the attached Exhibit, which is an equivalent hardness table taken from the website www.gordonengland.com.uk.

In Miyata, Table 3 shows an achievable tensile strength (TS) of 732 MPa or less. Converting this value to HRC hardness using the attached Exhibit results in a hardness of 18.2, which is well below the lower limit of 30 HRC. This is further substantiation that the hardness characteristic of claims 1 and 3 is missing from Miyata and the rejection is in error.

Since Miyata does not use the same processing as the invention, the Examiner's basis that the claimed characteristics are inherently present fails. However, it would also be improper for the Examiner to allege that it would somehow be obvious to modify the process of Miyata so that it is the same as Applicants and then conclude inherency. The Examiner must have a reason for such a stance and no reason other than hindsight exists. Since hindsight cannot be the basis for an obvious rejection, the Examiner cannot legitimately take this position.

Even if the Examiner were to take such a position, the comparative evidence in the specification reveals that only by practicing the invention do improved results occur in

connection with local corrosion, sulfide stress cracking, and corrosive wear, see Tables 2 and 3 of the instant specification. This comparative evidence demonstrates that the control of the processing and composition produces results that are unexpected and this comparison is an effective rebuttal of the rejection based on Miyata.

Remaining Claims

Since only claims 1 and 3 were rejected based on Miyata, this reference cannot be said to establish a *prima facie* case of obviousness against the remaining claims 2, 4-8, and 13-20.

HARA

The Examiner's position regarding the rejection based on Hara is stated as follows:

> In regards to claims 1-8 and 13-20, Hara et al. ('465) discloses a martensitic steel alloy pipe that would have utility in oil and gas wells having composition relative to that of the instant invention as shown in the table below.
>
> The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorous, sulfur, chromium, nickel, aluminum, nitrogen, copper and molybdenum of the martensitic stainless steel alloy disclosed in Hara et al. ('465) overlaps the composition of the instant invention, which is *prima facie* evidence of obviousness......

The invention described in Hara can be said to be similar to that being claimed. Claim 1 of Hara states:

> 1. A high-corrosion-resistant martensitic stainless steel possessing excellent weldability, having a tempered martensitic structure, characterized by comprising steel constituents satisfying by weight C: 0.005 to 0.035%, Si: not more than 0.50%, Mn: 0.1 to 1.0%, P: not more than 0.03% S: not more than 0.005% Cr: 10.0 to 13 5% Cu: 10 to 4.0%, Ni: 1.5 to 5.0%, Al: not more than 0.06%, and N: not more than 0.01%,
>
> $C+N \leq 0.03$,
>
> $40C+34N+Ni+0.3Cu-1.1Cr \geq -10$,

with the balance consisting essentially of Fe.

An object of Hara is to provide a martensitic stainless steel having CO_2 corrosion property to withstand at a maximum temperature in use for line pipes, excellent sulfide stress corrosion cracking resistance, and excellent toughness in the welding heat affected zone, see col. 1, lines 43-48 of Hara.

Thus, it can be said that Hara is similar to the invention. In fact, it can be said that Steel No. 6 of the embodiments of Table 1 of Hara satisfies the compositional range of claims 1, 2, 13, and 14. However, this similarity does not mean that the invention is obvious in light of the teachings of Hara since the claims are not just compositional ranges but also include characteristics of the martensitic stainless steel that are not found in Hara. The arguments in favor of the patentability of the claims over Hara are set out below under the headings of the rejected claims.

<u>Claims 1-8</u>

Claims 1-8 define the stainless steel composition in terms of hardness and the amount of carbides in the grain boundaries. The Examiner admits that these features are not disclosed in Hara but nevertheless concludes that they are present because Hara "discloses substantially the same composition in addition to hot rolling and cold rolling to form a pipe (plastically processed history)(abstract and col. 2, lines 12-23). Therefore, these properties would be expected."

The steel of Hara is made by a production method, which can be seen in claims 14-16 of the patent. Claim 14 states:

> 14. A process for producing a high-corrosion-resistant martensitic stainless steel possessing excellent weldability, characterized by comprising the steps of: subjecting a steel plate, produced by hot-rolling a stainless steel slab having a composition according to claim 2 to austenitization at a

temperature of Ac_3 point to 1000 °C. to harden the steel plate and heating to a dual phase region between Ac_1 point and Ac_3 point; subjecting the hardened steel plate to final tempering at a temperature of 550 °C. to Ac_1 point; and cold-rolling the steel plate. (emphasis added)

It is plain to see from claim 14 that Hara entails heating in the dual phase region after quenching and further tempering at a temperature in the range of 550 °C to the Ac_1 point.

Col. 6, lines 3-22 of Hara states:

> The steel of the present invention is quenched at a temperature of Ac_3 to 1000 °C. This is because when the hardening temperature exceeds 1000 °C., grains are coarsened to deteriorate the toughness, while when it is below Ac_3, a dual-phase region of austenite and ferrite is formed.
>
> Further, it is difficult to easily temper the steel of the present invention by conducting tempering once. For this reason, the tempering is usually carried out twice. However, when single tempering suffices for the contemplated purpose, there is no need to repeat the tempering procedure. Regarding the final tempering temperature, when the temperature exceeds Ac_1, fresh martensite is formed after tempering, resulting in increased hardness and deteriorated toughness. Therefore, the upper limit of the final tempering temperature is Ac_1. On the other hand, a tempering temperature below 550 °C. is excessively low for attaining contemplated tempering. Therefore, in this case, the tempering is unsatisfactory, and, in addition, the hardness is not decreased. For the above reason, the lower limit of the final tempering temperature is 550 °C.

From this, it is clear that Hara sees it as essential to perform the final tempering at a temperature in the range of 500 °C to the Ac_1 point so that based on this step, a preceding heating in a dual phase region and preceding tempering are contemplated. Therefore, it is evident that Hara cannot be said to meet the limitation regarding the carbide amount and hardness since the processing of Hara is not the same as that employed by the inventors to attain this objective.

As explained above, the Examiner admitted that the claimed hardness was not expressly taught in Hara but that it would be expected to be present. To contest this stance, Applicants refer to the attached Exhibit.

In Table 2 of Hara, an achievable tensile strength (TS) of 824 MPa or less is shown. Converting this value to HRC hardness using the attached Exhibit results in a hardness of 23.5, which is well below the lower limit of 30 HRC. This is further substantiation that the hardness characteristic of claims 1-8 and 13-20 is missing from Hara and the rejection is in error.

Since Hara does not use the same processing as the invention, the Examiner's basis that the claimed characteristics are inherently present fails. However, it would also be improper for the Examiner to allege that it would somehow be obvious to modify the process of Hara so that it is the same as Applicants and then conclude inherency. The Examiner must have a reason for such a stance and no reason other than hindsight exists. Since hindsight cannot be the basis for an obvious rejection, the Examiner cannot legitimately take this position.

Even if the Examiner were to take such a position, the comparative evidence in the specification reveals that only by practicing the invention do improved results occur in connection with local corrosion, sulfide stress cracking, and corrosive wear, see Tables 2 and 3 of the instant specification. This comparative evidence demonstrates that the control of the processing and composition produces results that are unexpected and this comparison is an effective rebuttal of the rejection based on Hara.

<u>Claims 13-20</u>

Claims 13-20 are patentable over Hara since they include the limitations of claims 1-8, which are demonstrated above to be patentable over Hara.

SUMMARY

The Examiner has failed to establish a *prima facie* case of obviousness against claims 1 and 3 based on Miyata. Clearly, Miyata and the invention are completely different not only with respect to composition, but also production process and technical philosophy. The invention according to claims 1 and 3, by virtue of its controlled composition, hardness, and amount of carbides in the grain boundaries can insure improved sulfide stress corrosion cracking resistance, abrasive resistance, and local corrosion resistance. Miyata fails to teach or suggest the production process resulting in the claimed characteristics as well as the claimed hardness and composition. Therefore, the rejection based on Miyata must be withdrawn.

The Examiner has failed to establish a *prima facie* case of obviousness against claims 1-8 and 13-20 based on Hara. The characteristics of the claimed steel in terms of hardness and carbide amount cannot be assumed to be present in Hara since the processing Hara is not even similar to that employed according to the specification to obtain the claimed characteristics. Also, the implied hardness of Hara does not meet the claim limitation and this is a further substantiation that a *prima facie* case of obviousness has not been established.

In light of this response, the Examiner is respectfully requested to examine this application in light of this amendment, and pass claims 1-8 and 13-20 onto issuance.

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Also, this filing at least places this application in better form for appeal so that it should be entered for this purpose if the Examiner maintains the rejection.

If the Examiner believes that an interview with Applicants' attorney would be helpful in expediting prosecution of this application, the Examiner is respectfully requested to telephone the undersigned at 202-835-1753.

Again, reconsideration and allowance of this application is respectfully requested.

The above constitutes a complete response to all issues raised in the Office Action dated September 26, 2008.

Please charge any fee deficiency or credit any overpayment to Deposit Account No. 50-1088.

Respectfully submitted,
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